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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,748	06/30/2004	Yuuichi Yakumaru	MTS-3493US	3097

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EXAMINER	
NALVEN, EMILY IRIS	
ART UNIT	**PAPER NUMBER**
3744	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/13/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/501,748	YAKUMARU ET AL.	
	Examiner	Art Unit	
	Emily I. Nalven	3744	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *June 30, 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,6-8 and 18-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-2,6-8,18-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *June 30, 2004, May 12 2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested: Refrigerating Cycle Device Using Carbon Dioxide as a Working Medium.

Claim Objections

Claims 1-2, 6-8 and 18-23, are objected to because of the following informalities:

In regard to claim 1, the recitation "said first decompressor and first air" (p. 1 line 8) is presumed to be -- said first decompressor and ambient air --. The recitation "the second decompressor and second air" (p. 1 line 15) is presumed to be -- the second decompressor and ambient air --. The recitation "a power engine which heats the water, the refrigerant-water heat exchanger" (p. 1 lines 17-19) is presumed to be -- a power engine, which heats the water and the refrigerant-water heat exchanger --. The recitation "with respect to flow of said second air" (p. 2 line 2) is presumed to be -- with respect to flow of said ambient air --.

In regard to claim 2, the recitation "degree of opening of the second decompressor" (line 2) is presumed to be -- degree of the opening on the second decompressor --.

In regard to claims 6-8 and 18-23, they are objected to because of their dependence on claim 1 which is objected to.

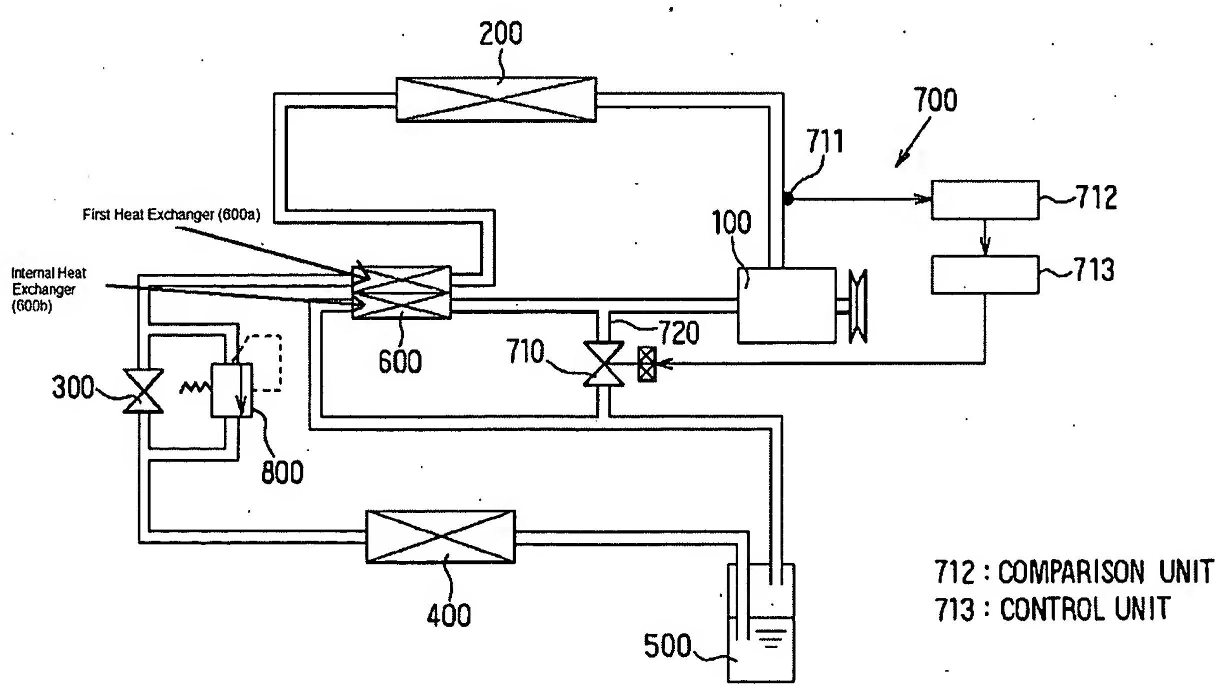
Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-2, 6-8 and 18-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuroda et. al. (US Patent No. 6,105,286) in view of Masahiro et. al. (Japanese Patent No. 2002-081768).

FIG. I



In regard to claim 1, Kuroda et. al. teach a refrigeration cycle device comprising a refrigeration cycle which is formed by sequentially connecting a compressor (100) which compresses a refrigerant that contains carbon dioxide (col 5 lines 13-14), a first decompressor (800) that is capable of decompressing the compressed refrigerant (col 5 lines 19-22), a first heat exchanger (600a) which performs heat exchange between the refrigerant which goes through said first decompressor (800) and ambient air (see annotated Fig. 1 above) and an internal heat exchanger (600b) which performs heat exchange between the refrigerant having passed through said first heat exchanger and the refrigerant before being sucked by said compressor (see annotated Fig. 1 above). The term "sequentially" is presumed to mean that the compressor (100), first heat exchanger (600a) and first decompressor (800) are all connected in a regular order and that the refrigerant flows through all of the above elements, thus connecting them.

Kuroda et. al. also teach a second decompressor (300) which decompresses the refrigerant having passed through the internal heat exchanger (600b) (see annotated Fig. 1 above), a second heat exchanger (400) which performs heat exchange between the refrigerant which is decompressed by the second decompressor (300), ambient air and internal heat exchanger (600b) (see annotated Fig. 1 above and col 8 lines 24-27). Since the refrigerant cycles

through the entire system it goes through heat exchange with the internal and second heat exchangers and ambient air entering the system throughout.

Kuroda et. al. also teach a heater core (200) (col 5 lines 14-16) which is arranged downstream of the second heat exchanger with respect to flow of ambient air and a radiator (200) (see annotated Fig. 1 above) wherein air conditioning capacity is adjusted by a degree of opening the second decompressor (300) at the time of heating and dehumidifying (col 8 lines 1-13).

However, Kuroda et. al. don't explicitly teach a refrigerant-water heat exchanger which performs heat exchange between water which circulates in a water cycle and the refrigerant, that the water cycle is formed by sequentially connecting a power engine which heats the water and the refrigerant-water heat exchanger.

Masahiro et. al. teach a refrigerant-water heat exchanger (2) which performs heat exchange between water which circulates in a water cycle and the refrigerant (see abstract). Masahiro et. al. also teach that the water-cycle is formed by sequentially connecting a power engine (5), which heats the water and the refrigerant-water heat exchanger (2) (see abstract). The heat pump water heater (5) includes a motor because displacing the refrigerant requires work, which a motor produces.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use refrigerant-water heat exchanger (2) as taught by Masahiro et. al. in the refrigeration cycle as taught by Kuroda et. al. because water is an inexpensive, durable and safe refrigerant in addition to making it easier to maintain and clean the cycle components using water in the heat exchanger. It would have been obvious to one of ordinary skill in the art at the time of the invention to sequentially connect a power engine (5) and a refrigerant-water heat exchanger (2) as taught by Masahiro et. al. in the refrigeration cycle as taught by Kuroda et. al. because adding a power engine to heat the water improves the efficiency of the refrigerant-water heat exchanger enabling the refrigeration cycle to run at lower operating costs.

In regard to claim 2, Kuroda et. al. teach a refrigerating cycle wherein during the adjustment of the degree of the opening on the second decompressor (300) at the time of heating and dehumidifying a discharge temperature of the compressor (100) is detected, the detected discharge temperature (711) (col 5 lines 51-52) and a set discharge temperature (712) are compared and the degree of opening of the second decompressor (300) is increased when the detected discharge temperature is equal to or more than the set discharge temperature (col 5 lines 49-58).

In regard to claim 6, Kuroda et. al. teach a refrigeration cycle comprising a third bypass circuit which connects an inlet and an outlet of the first heat exchanger (200) by way of a third open/close valve (1007) (see Fig. 22).

In regard to claim 7, Kuroda et. al. teach a refrigeration cycle comprising a fourth open/close valve (407) at an inlet of said first heat exchanger (600a) (see Fig. 16) but do not explicitly teach a third and fourth open/close valve in the same embodiment. It would have been obvious to one of ordinary skill in the art at the time of the invention to place the third open/close valve (1007) as taught by Kuroda et. al. with a fourth open/close valve (407) because a fourth valve is an added security measure should too much pressure or refrigerant build up in the refrigeration cycle, some refrigerant could bypass the first heat exchanger and go to another element in the circuit thereby improving the efficiency of the system and preventing any malfunction which would also lead to economic loss.

In regard to claim 8, Kuroda et. al. teach a refrigeration cycle comprising a fifth open/close valve (807) disposed between an outlet of heat exchanger (600a) and first decompressor (300), but do not teach that the heat exchanger (600a) is a refrigeration-water heat exchanger. Masahiro et. al. teach a refrigeration-water heat exchanger (2) and first decompressor (3) (see Fig. 1) in series. It would have been obvious to one of ordinary skill in the art at the time of the invention to place the refrigeration-water heat exchanger (2) as taught by Masahiro et. al. in

the refrigeration cycle as taught by Kuroda et. al. because using a heat exchanger that uses both CO_2 and water is less expensive and easier to maintain than a system that uses solely CO_2 as a refrigerant.

Kuroda et. al. also teach a first three-way valve (710) which is disposed between an outlet of said first heat exchanger (200) and an inlet of said internal heat exchanger (600a) (see Fig. 14).

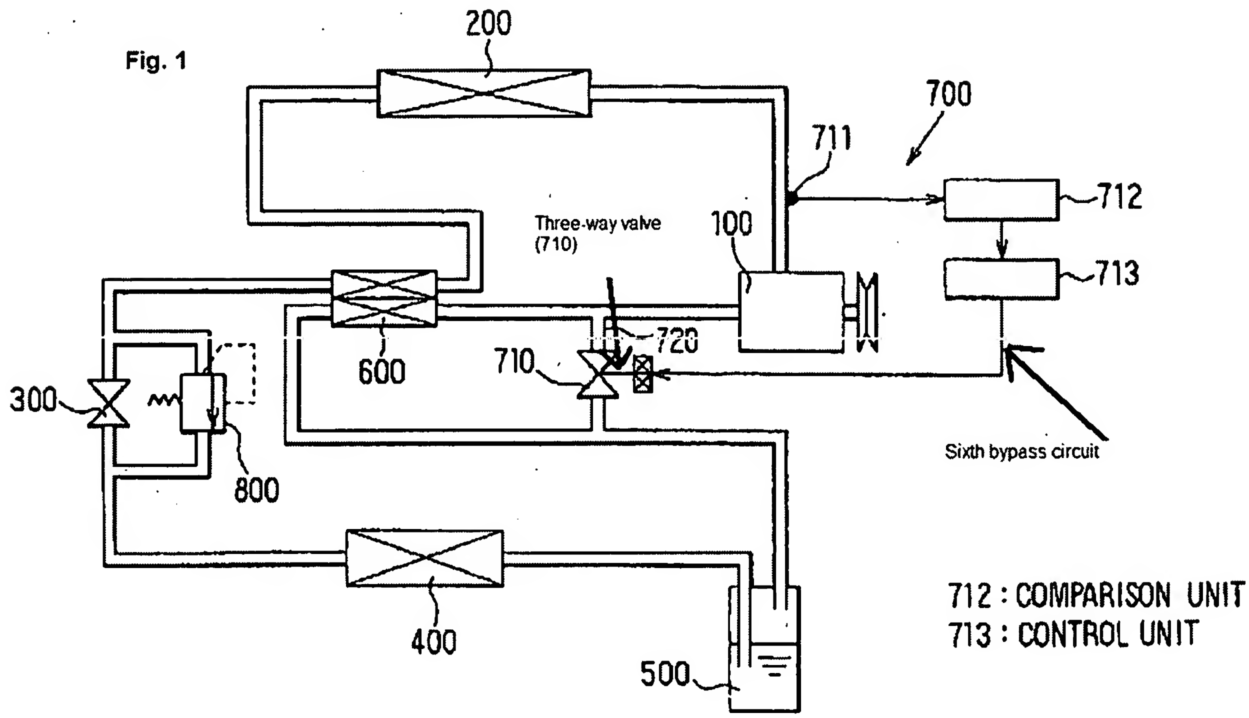
Kuroda et. al. also teach a fourth bypass circuit which is connected by having one end thereof disposed between an outlet of said heat exchanger (600a) and an inlet of said fifth open/close valve (751) and the other end formed of said first three-way valve (710 and 720) (col 8 lines 36-43 and col 9 lines 50-52). Masahiro et. al. teach a that the heat exchanger is a refrigerant-water heat exchanger (2). It would have been obvious to one of ordinary skill in the art at the time of the invention to place the refrigeration-water heat exchanger (2) as taught by Masahiro et. al. in the refrigeration cycle as taught by Kuroda et. al. because using a heat exchanger that uses both CO_2 and water is less expensive and easier to maintain than a system that uses solely CO_2 as a refrigerant.

Kuroda et. al. teach an internal heat exchanger (600b) and a second decompressor (300) but do not explicitly teach a second three-way valve disposed between an outlet of said internal heat exchanger (600b) and an inlet of

said second decompressor (300). It would have been obvious to one of ordinary skill in the art at the time of the invention to place a second three-way valve between the outlet of said internal heat exchanger and said second decompressor (see Fig. 1) because a second three-way valve would allow the refrigerant to go into either the first decompressor (300) or second decompressor (300) preventing too much refrigerant from going into either one and potentially damaging the refrigeration cycle, reducing its efficiency and incurring costs to the operators.

It would have been obvious to one of ordinary skill in the art at the time of the invention to insert a fifth bypass circuit connected to a second three-way valve and the other end disposed between an outlet of a fifth open/close valve (751) and an inlet of said first decompressor (300) because having a fifth bypass circuit around the first decompressor (300) gives the refrigerant one more path to flow through should there be any blockages in the pipelines, reduces the pressure going through the other circuits and enables the first decompressor (300) to have another outlet for refrigerant flow should there be too much refrigerant or a malfunction somewhere else in the system.

Fig. 1



Kuroda et. al. teach a sixth bypass circuit which is connected by having one end thereof disposed between an outlet of said first heat exchanger (600a) and said first three-way valve (710 and 720) (see Fig. 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to place a second three-way valve and said second decompressor (300) and by way of a sixth open/close valve because adding a second three-way valve would let the refrigerant flow directly from the compressor or first heat exchanger to the second decompressor without having to traverse through the entire system if there was a problem with either the compressor or first heat exchanger and the refrigerant could be decompressed quickly preventing damage to the system or costs to the operators.

Kuroda et. al. teach a refrigerant circulation mode changeover means (713) which selectively changes over a steady mode in which the refrigerant is flown out from said heat exchanger is circulated by way of a said fifth open/close valve and a start mode in which the refrigerant is circulated in said fourth bypass circuit and said fifth bypass circuit (col 5 lines 59-63). Masahiro et. al. teach that a heat exchanger is a refrigerant-water heat exchanger. It would have been obvious to one of ordinary skill in the art at the time of the invention to place the refrigeration-water heat exchanger (2) as taught by Masahiro et. al. in the refrigeration cycle as taught by Kuroda et. al. because using a heat exchanger that uses both CO_2 and water is less expensive and easier to maintain than a system that uses solely CO_2 as a refrigerant.

In regard to claim 18, Kuroda et. al. teach a refrigerating cycle device wherein during the adjustment of the degree of opening of the second decompressor (300) at the time of heating and dehumidifying, a refrigerant temperature Teva of the second heat exchanger (400) is detected (col 5 lines 33-39).

Kuroda et. al. also teach that a set refrigerant temperature Txeva and the detected refrigerant temperature Teva are compared and the degree of opening of the second decompressor (300) is decreased when the detected refrigerant temperature Teva is equal to or more than the set refrigerant temperature Txeva

and is increased when the detected refrigerant temperature Teva is less than the set refrigerant temperature Txeva (col 5 lines 49-58).

In regard to claim 19, Kuroda et. al. teach a refrigerating cycle device wherein the air conditioning capacity is further adjusted by adjusting a degree of opening of the first decompressor (800) at the time of heating and dehumidifying (col 6 lines 1-4).

In regard to claim 20, Kuroda et. al. teach a detection temperature sensor (711) (col 5 lines 49-50). Kuroda et. al. also teach a first decompressor (800) but do not explicitly teach that the temperature sensor detects the adjustment of the first heat exchanger.

It would have been obvious to one of ordinary skill in the art at the time of the invention to place a detection temperature sensor on the first decompressor during the adjustment of the degree of opening of the first decompressor at the time of heating and dehumidifying, a refrigerant temperature Tm of the first heat exchanger is detected because if the refrigerant temperature is too high the system can diverge some of the refrigerant into the second decompressor to prevent too large a pressure and too high a temperature of refrigerant from entering the first decompressor and potentially damaging the entire system and incurring costs to the operators.

Kuroda et. al. also teach that a set refrigerant temperature Txm and the detected refrigerant temperature Tm are compared (712), and the degree of opening of the compressor (100) is decreased when the detected refrigerant (col 5 lines 49-58). It would have been obvious to one of ordinary skill in the art at the time of the invention to place the comparison unit (712) on the first decompressor (800) to ensure that the refrigeration cycle is working properly and there aren't any malfunctions in the first decompressor (800) that could harm the efficiency of the system and incur costs to the operators.

In regard to claim 21, Kuroda et. al. teach a refrigerating cycle but wherein the dehumidifying device comprises blow-off air temperature detection means, which detects a temperature of blow-off air blown off by way of said heater core (200) (col 5 lines 43-51).

Kuroda et. al. also teach a compressor (100) operating frequency control means which controls operating frequency of said compressor (100) (col 10 lines 21-28) and said compressor (100) operating frequency control means controls the operating frequency of said compressor (100) in response to said detected air temperature. The refrigerant entering the compressor (100) and being detected by the temperature sensors (700) has undergone heat exchange in heater core (200), which interacts with blown ambient-air.

In regard to claim 22, Kuroda et. al. teach a refrigerating cycle device wherein the dehumidifying device (300) comprises discharged refrigerant temperature detection mean, which detects a discharged refrigerant temperature of said compressor (100) (col 6 lines 1-4).

Kuroda et. al. also teach a bypass circuit which bypasses between an outlet of said second heat exchanger (400) and an inlet of said compressor (100) by way of an open/close valve (607) (see Figs. 18 and 19) and that said open/close (607) valve has opening and closing thereof controlled in response to said detected discharge refrigerant temperature (col 11 lines 17-20).

In regard to claim 23, Kuroda et. al. teach a refrigerating cycle device which is used as an air conditioner for a vehicle (col 5 lines 9-12). The term "used as an air conditioner" does not positively describe the device that is claimed, rather it is intended use for the refrigerating cycle.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Emily I. Nalven whose telephone number is 571-272-3045. The examiner can normally be reached on Monday - Thursday 8 AM - 5:30 PM and on alternate Fridays 8 AM – 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl J. Tyler can be reached on 571-272-4834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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Art Unit 3744

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